

Bulk Nano-structured Materials for Turbomachinery Components, Phase I

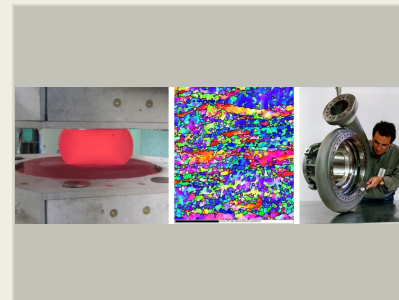
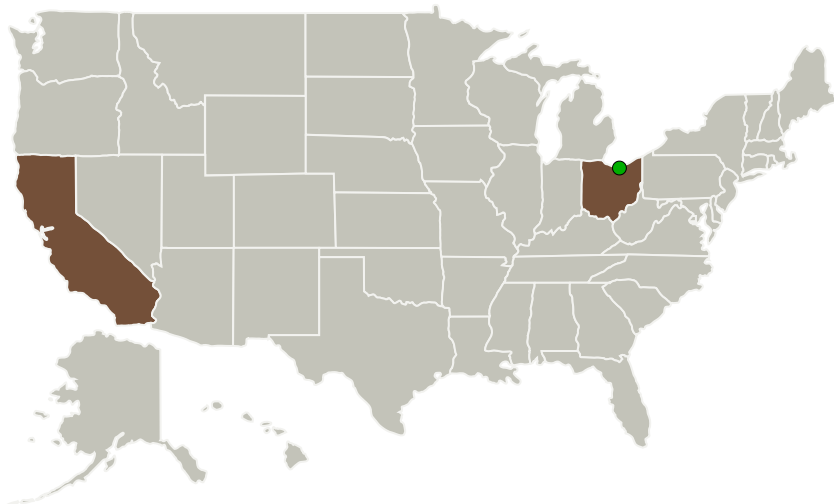
Completed Technology Project (2015 - 2015)



Project Introduction

This SBIR Phase I effort seeks to exploit some of the tremendous benefits that could be attained from a revolutionary new approach to grain refinement in bulk metals. Specifically, preforms of high temperature Ni-base superalloys will be produced in this work with fine grain (FG) to ultra fine grain (UFG) micro-/nano-structures for higher strength. Despite their excellent corrosion resistance and ability to retain strength under extreme operating conditions, the relatively low strength of IN625 and Monel 400 have prevented their more widespread use. Thus, grain refinement methods that incorporate severe plastic deformation (SPD) offer the opportunity to increase the strength of these alloys. Most SPD work to date, however, have only been successfully performed on small, laboratory scale samples given the special (expensive) tools and high pressures needed.. Thus, the present work will demonstrate a new, production level grain refinement technology to produce microstructurally enhanced IN625 and Monel 400 material with higher strength capability for in-space propulsion applications.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Transition45 Technologies, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Orange, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

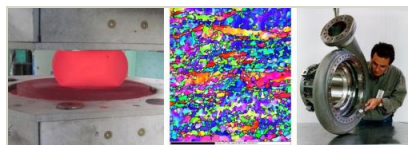
California	Ohio
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Project Transitions

**July 2015:** Project Start**December 2015:** Closed out**Closeout Summary:** Bulk Nano-structured Materials for Turbomachinery Components, Phase I Project Image**Closeout Documentation:**

- Final Summary Chart Image(<https://techport.nasa.gov/file/138850>)

Images

**Briefing Chart Image**

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(<https://techport.nasa.gov/image/128974>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Transition45 Technologies, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

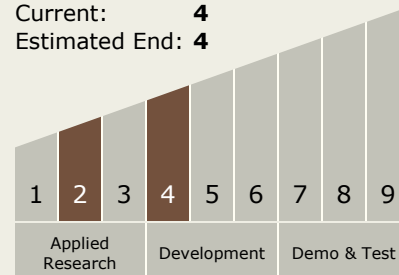
Edward Chen

Technology Maturity (TRL)

Start: 2

Current: 4

Estimated End: 4



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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.3 Cryogenic

Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System